SDMS US EPA REGION V

COLOR - RESOLUTION - 3

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SITE NAME	SAUGET AREA 1
DOC ID #	150588
DOCUMENT VARIATION	__X__ COLOR **OR** ___ RESOLUTION
PRP	
PHASE	SAS
OPERABLE UNITS	
LOCATION	Box #__ Folder #____ Subsection_____
PHASE (AR DOCUMENTS ONLY)	___ Remedial ___ Removal ___ Deletion Docket ____ ____ Original ____ Update # ____ Volume ___ of ___
COMMENT(S) SITE LOCATION MAPS	

United States
Environmental Protection
Agency

Environmental Monitoring
Systems Laboratory
P.O. Box 15027
Las Vegas, NV 89114

TS-AMD-8128
February 1981

Research and Development

EPA

Thermal Infrared Survey of Hazardous Waste Sites East St. Louis, Illinois

REF 7

prepared for
EPA Region 5

TS-AMD-8128
February 1981

THERMAL INFRARED SURVEY OF HAZARDOUS WASTE SITES EAST ST. LOUIS, ILLINOIS

by

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Contract No. 68-03-2636

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OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
LAS VEGAS, NEVADA 89114

ABSTRACT

A thermal infrared survey of suspected hazardous waste sites was conducted on December 18, 1980, by the Environmental Monitoring Systems Laboratory - Las Vegas to support the Uncontrolled Hazardous Waste Site Investigation Program of the Environmental Protection Agency, Region V. The sites are located along the Dead Creek between Jerome Street and the Alton and Southern Railroad in East St. Louis, Illinois. A total of five actual sites and two suspected sites were identified within the survey area. Analysis of the Multispectral Scanner Data revealed no significant surface thermal signatures within the land disposal area; however, thermal discharges were noted into the Dead Creek lagoon.

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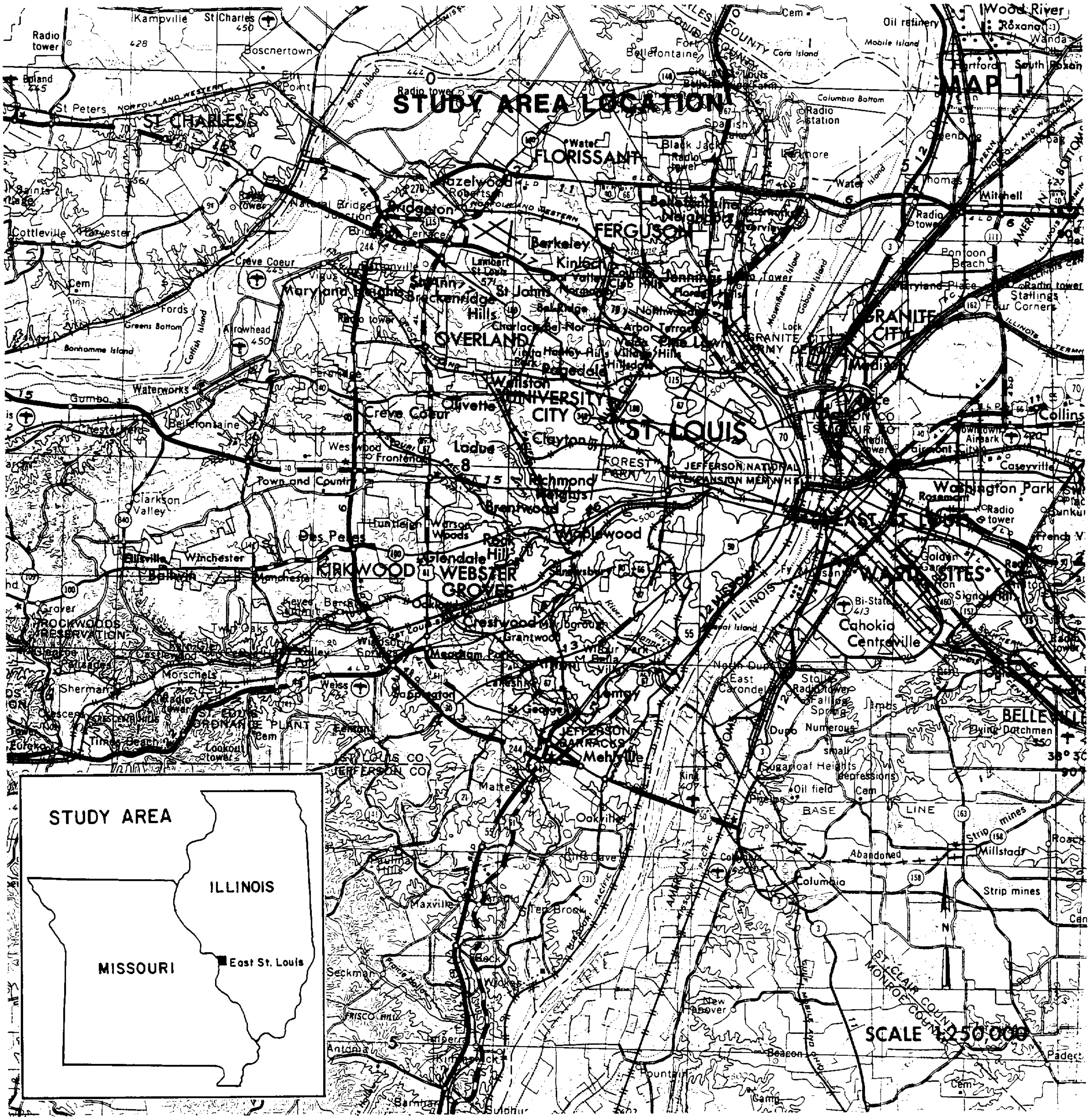
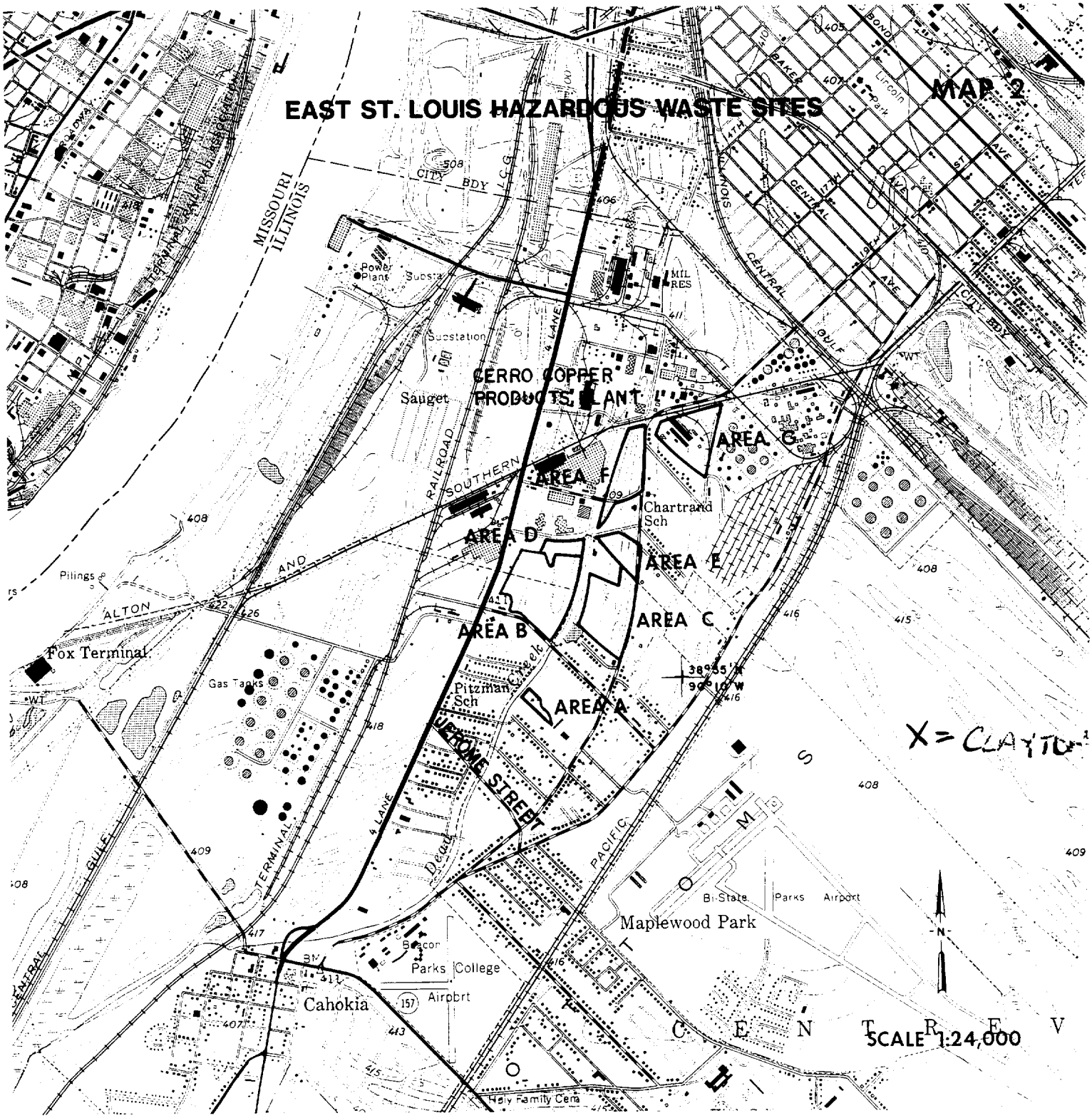
THERMAL IMAGE


MAP 1
STUDY AREA LOCATION
STUDY AREA
ILLINOIS
MISSOURI
East St. Louis
SCALE 1:250 000
ST CHARLES
FLORISSANT
FERGUSON
OVERLAND
UNIVERSITY CITY
ST LOUIS
GRANITE CITY
KIRKWOOD
WEBSTER GROVES
EAST ST LOUIS
WASTE SITES
BELLEVILLE

INTRODUCTION

Through the Uncontrolled Hazardous Waste Site Investigation Program, EPA, Region V, requested the Environmental Monitoring Systems Laboratory -Las Vegas conduct a thermal infrared survey of suspected hazardous waste sites in East St. Louis, Illinois. Multispectral Scanner Data and color infrared photography were acquired on December 18, 1980, of approximately 3.2 kilometers (2 miles) of Dead Creek. The survey area extended from Jerome Street on the south to the Cerro Copper Products plant on the north.

It is suspected that several areas along the Dead Creek have been used for hazardous waste burial sites and may be detectable by remote sensing methods.


EAST ST. LOUIS HAZARDOUS WASTE SITES
MAP 2
MISSOURI
ILLINOIS
CITY BDY
CERRO COPPER
PRODUCTS PLANT
Sauget
AREA A
AREA B
AREA C
AREA D
AREA E
AREA F
AREA G
SOUTHERN RAILROAD
JEROME STREET
Dead Creek
Chartrand Sch
Pitzman Sch
Fox Terminal
Gas Tanks
Pilings
ALTON AND
Cahokia
Parks College
Airport
Maplewood Park
Bi-State Parks Airport
Holy Family Cem
X = CLAYTON
SCALE 1:24,000

ANALYSIS SUMMARY

Analysis of the color infrared photography revealed five active waste disposal areas and two probable, revegetated burial sites. To facilitate identification and reference, individual sites were assigned letter designators from south to north and west to east.

The Dead Creek has been blocked by construction of a new road immediately south of the Cerro Copper Products plant. This blockage caused a lagoon to be formed from this road, north, to the Alton and Southern rail line. Dead Creek is dry from the newly constructed road, south, to the limit of survey coverage.

Two of the areas ("B" and "C") have been returned to agricultural use but reveal vegetation patterns which indicate stress from possible subsurface trenches containing buried hazardous waste. The other five areas contain surface waste consisting of containerized materials and industrial sludge. All areas, except "B" and "C", display signs of seepage and/or leaching.

Analysis of the multispectral scanner data revealed no thermal influence over the land masses surveyed. A temperature variation of 3.5 degrees Celsius was detected in the Dead Creek lagoon and four outfalls were detected entering the lagoon from the Cerro Copper Products plant.

PHOTO ANALYSIS

Area "A" is an industrial waste site associated with Hall Construction Company, adjacent to Dead Creek. The waste pit is revetted along the creek; however, seepage stains are noted through the pit revetment as well as the adjacent, abandoned quarry. All spills/runoff from the entire site will collect along the Dead Creek revetments. Recent scraper operation is visible in the abandoned quarry; however, the content of the fill material can not be determined from aerial photography.

PHOTO ANALYSIS

Area "B" and "C" are potential revegetated waste disposal areas. Both areas display vegetation damage patterns of subsurface influence. The distinct edges of the stress patterns indicate a trench effect as opposed to the more mottled patterns in the same areas which could be caused by naturally poorer soil. It is recommended that archival photography be acquired of Areas "B" and "C" to ascertain the definite cause of these stress areas and, possibly, the origin of the stress causing materials. Heavy vegetation along the banks of the Dead Creek preclude detection of possible leaching into the creek from either of these two areas. Extensive dozer activity within the small annotated area, located in the southwest corner of Area "B", indicates possible industrial waste disposal. Incomplete stereo photographic coverage precludes positive identification as a waste site.

Area "D" appears to be an old disposal area with heavy overgrowth. Surface seepage is apparent within the site and evidence of leaching is visible along the west bank of Dead Creek.

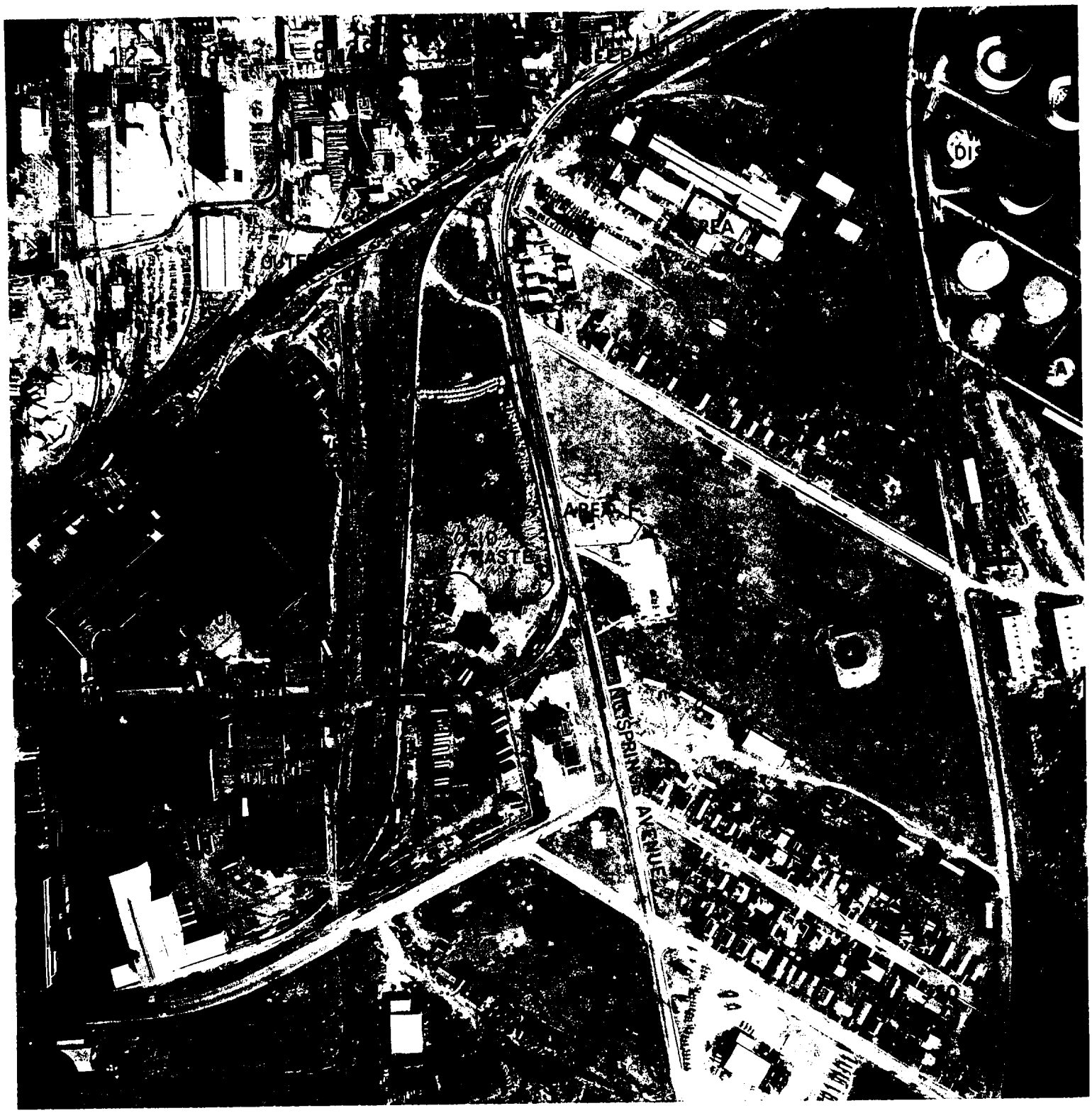
Area "E" has extensive sludge-type waste being disposed of in the central and southeast portions of the site. Extensive stains and the presence of two truck tanker trailers indicate the eastern portion of the area is being used for liquid waste disposal. No surface seepage is visible; however, some runoff from the southwest has been entering the Dead Creek. Also, two drains, probably originating in the large building on the site, are visible on the east bank of the creek.


PROBABLE

PHOTO ANALYSIS

Area "F" is a solid waste disposal site immediately west of Chartrand School. Sludge-type waste is being dumped throughout the area. The area between the railroad tracks and the Dead Creek lagoon appears to be used for railroad car cleaning. Surface drainage from this area enters directly into the lagoon. Drainage from the truck park area parallels the western perimeter and enters the lagoon via a culvert under the railroad tracks. The main plant to the west has three visible outfalls and one surface drainage into the lagoon. The lagoon does not extend beyond the road forming the southern perimeter of the main plant and culminates at a culvert under the Alton and Southern Railroad to the north. No effluent is visible either entering or exiting the culvert at the time of overflight; however, due to the flat terrain, liquids could flow in either direction, depending on amount and location of discharge.

Area "G" is located just east of the intersection of Falling Springs Avenue and the Alton and Southern rail line. There are two waste disposal areas within the small industrial complex. The area in the southeast corner of the site surrounds a large open pit containing an accumulation of seepage at its apex. Containerized waste is visible within the pit; however, the surrounding area appears to consist of graded sludge. The visible waste in the northern disposal area consists entirely of graded sludge. A crane is in the process of removing sludge from the settling ponds immediately north of the plant. Approximately 800 drums are stacked in an uncontained area adjacent to the westernmost plant building. Surface seepage is visible along the perimeter of the northern disposal area; however, it appears to be contained by the railroad junction.


SPRINGS AVENUE

THERMAL ANALYSIS

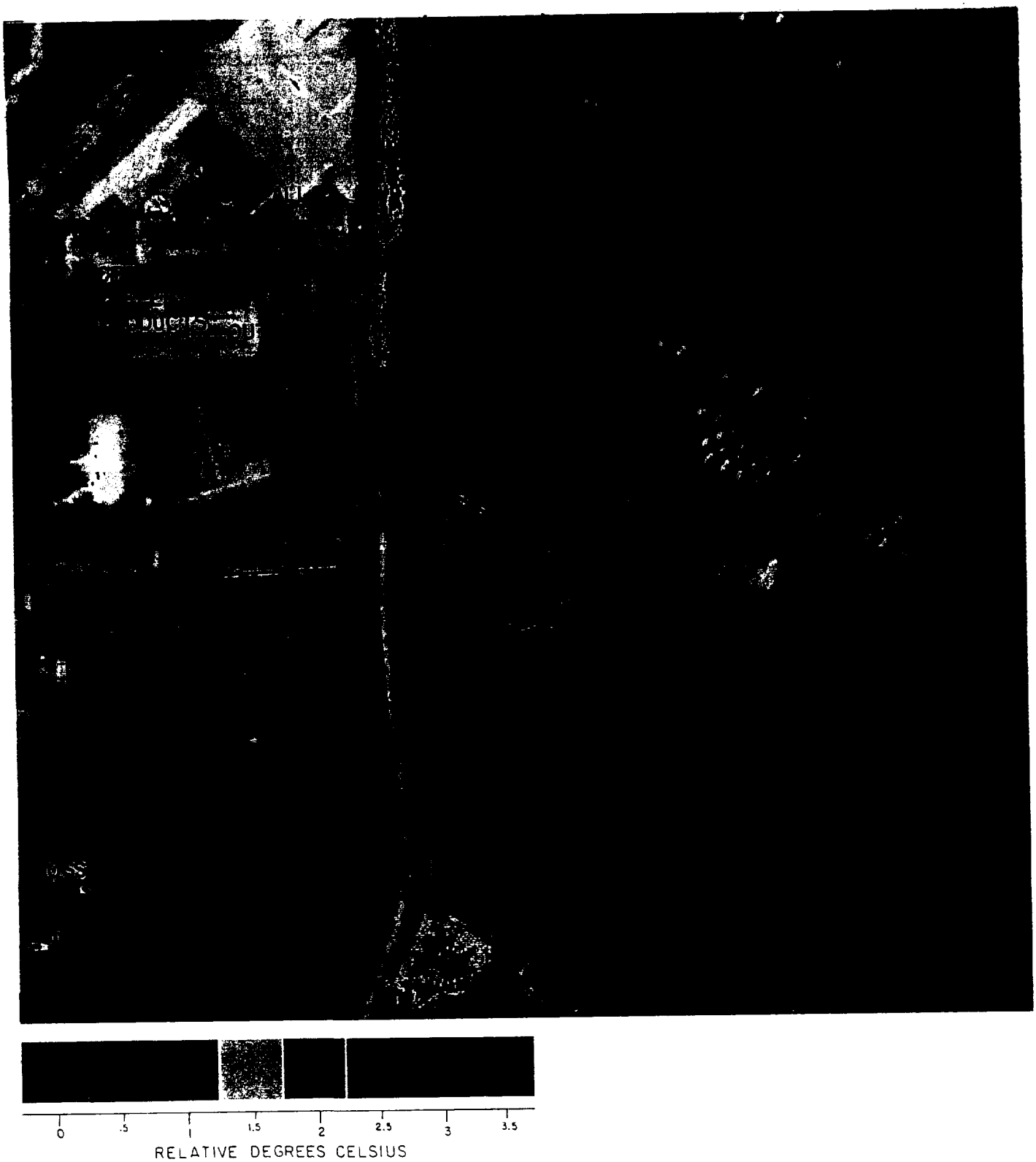
Multispectral data was acquired of the entire survey area; however, analysis of the data revealed no significant thermal influence over the land mass area. Therefore, only those areas immediately adjacent to the water body are included in this report.

The Dead Creek Lagoon displayed temperature variations of 3.5° Celsius. The water along the east bank, close to the lagoon bridge, was the coldest water temperature within the thermal map and was designated 0° Celsius (ambient). All other water within the scene was calibrated in 0.5° Celsius increments and related to this temperature.

The Cerro Copper Products plant displayed four discharges into the lagoon. The three northernmost discharges were operating at 3.5° Celsius above ambient and the south discharge was operating at 2.0° Celsius above ambient.

The temperature variation displayed within the abandoned settling pond, near the south edge of the image, is probably attributable to solar influence on the stagnant liquid.

The scanner and data processing are described in the Appendix (pages 13-18).


0
.5
1
1.5
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3.5
RELATIVE DEGREES CELSIUS

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APPENDIX

THE EMSL-LV MULTISPECTRAL SCANNER SYSTEM


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ODUCTS
OUT
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1
2
RELATIVE DEGREES CELSIUS

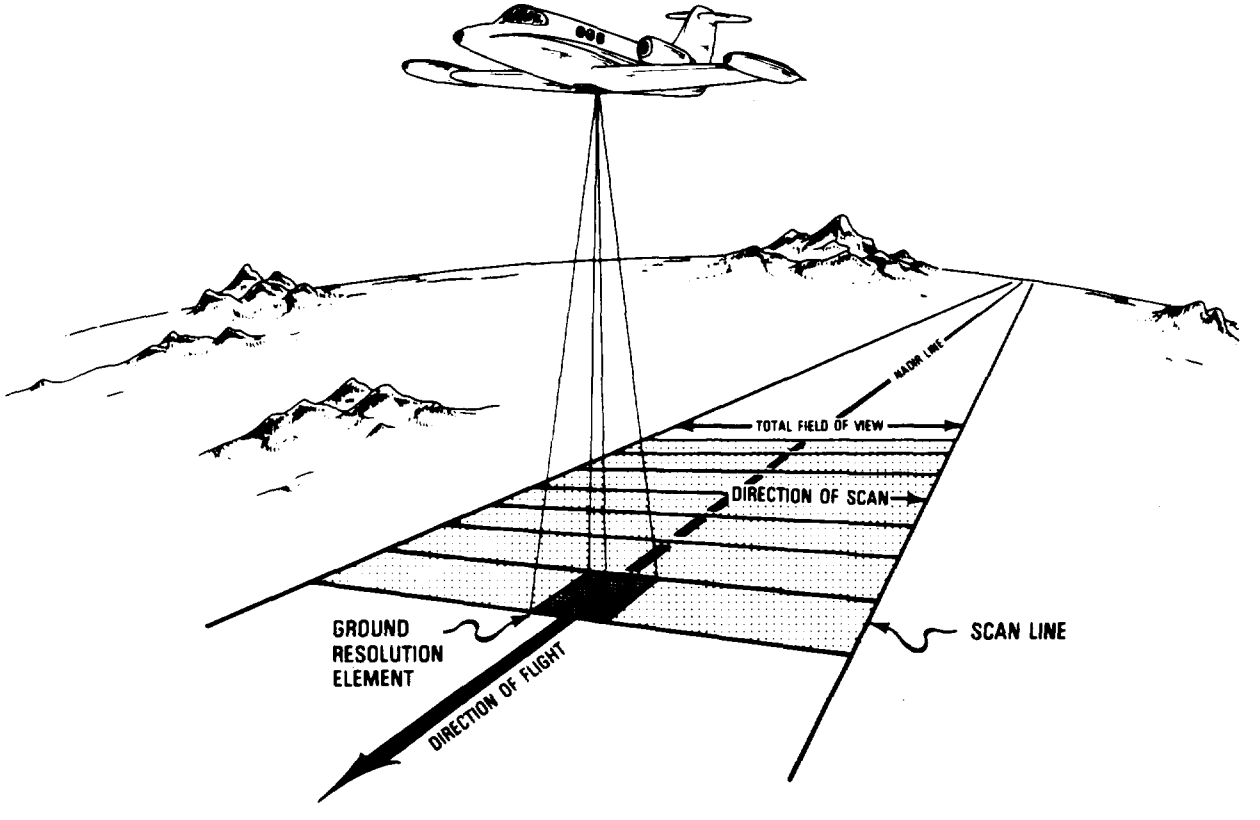
AIRBORNE MULTISPECTRAL SCANNER

The airborne multispectral scanner (MSS) acquires data at altitudes ranging from 370 to 6,100 meters (1,200 to 20,000 feet) above ground level. This is an 11-band system designed to collect and record radiant energy data in the near-ultraviolet through the thermal infrared portions of the electromagnetic spectrum (see Table on MSS Wavelength Bands). The scanner has a rotating mirror that scans across the ground scene, perpendicular to the line of flight. Radiant energy from the ground surface is reflected through focusing optics to a beam splitter which diverts the visible radiation (Channels 1-10) to a 10 channel spectrometer and the thermal infrared radiation (Channel 11) to a solid state detector. Electronic signals from the 11 detectors are digitized and recorded on magnetic tape in a high density format. During operation, the MSS scan rate is controlled and synchronized to the aircraft ground speed and altitude, resulting in scan line contiguity at nadir (see Figure on MSS Imaging Characteristics). The scanner is equipped with internal visible and thermal reference sources, which provide information for calibration of the data. The aircraft sensor tape is processed on a ground based Data Analysis System (DAS) to display, analyze, and create images of the surveyed scene.

MSS WAVELENGTH BANDS

Channel	Wavelength Band	Color/Spectrum
1	0.38-0.42μm	Near Ultraviolet
2	0.42-0.45μm	Blue
3	0.45-0.50μm	Blue
4	0.50-0.55μm	Green
5	0.55-0.60μm	Green
6	0.60-0.65μm	Red
7	0.65-0.70μm	Red
8	0.70-0.79μm	Near Infrared
9	0.80-0.89μm	Near Infrared
10	0.92-1.10μm	Near Infrared
11	8.00-14.00μm	Thermal Infrared

MULTISPECTRAL SCANNER
IMAGING CHARACTERISTICS (SIMPLIFIED)



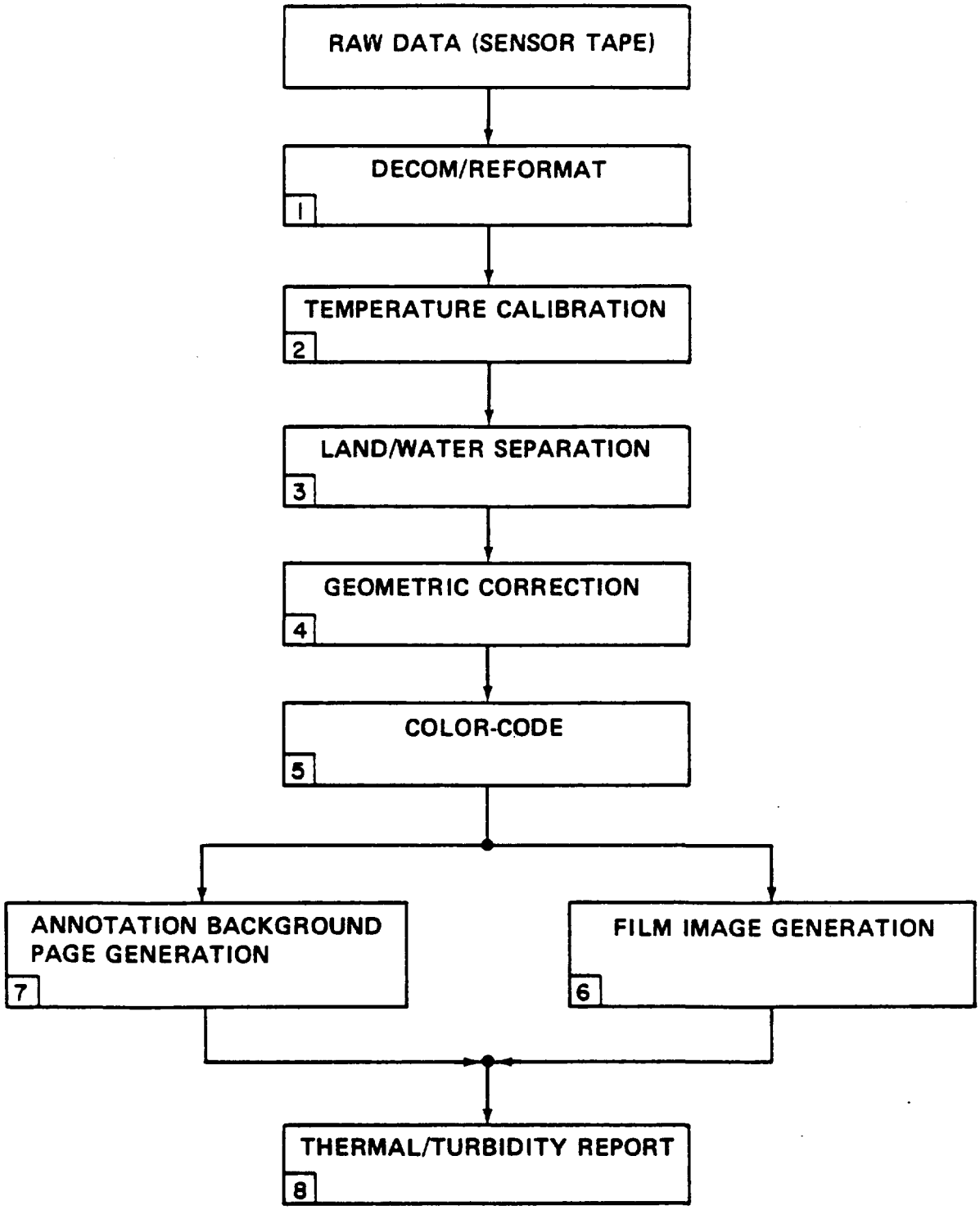
THERMAL DATA PROCESSING

For thermal mapping applications, the scanner's internal, temperature calibration reference sources (blackbodies) are used along with surface temperature measurements to develop an accurate surface temperature map. Data processing is accomplished with the Data Analysis System (DAS) (see Attached Figure) consisting of a sensor tape playback unit, a high speed digital computer, an interactive color display system, and an off-line color film recorder.

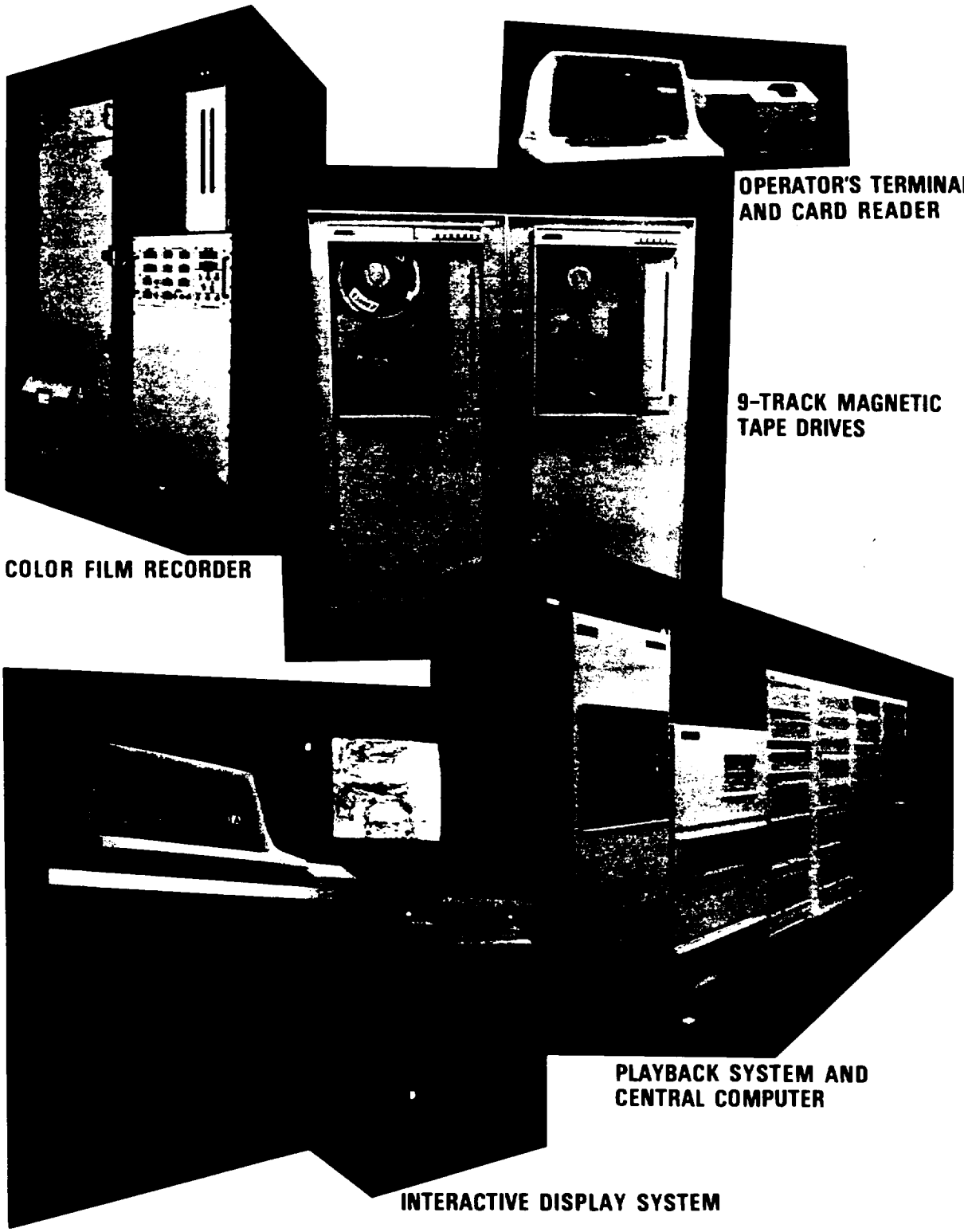
The Thermal Data Computer Processing diagram illustrates the steps involved in processing the scanner data. The sensor tape is reformatted to a 9-track computer compatible tape. Computations are then performed to calibrate the thermal image. Land and water areas in the imagery are separated. The water surface data are sliced into temperature levels and displayed in color. Land surfaces are displayed in shades of gray. A geometric correction is applied to the data to rectify scan line distortions. The data are output to magnetic tape and the desired film product is recorded on color film. Finally, an annotation print is generated on a printer/plotter. A color film print of the thermal image is then combined with a duplicate of the annotation print to complete the finished product.

The thermal image is essentially a temperature map. The temperature of the water surface is represented by distinct colors. The color bars establish relative temperatures in $1^{o}C$ or $0.5^{o}C$ increments. The ground truth reference, when provided, establishes absolute calibration. This defines the temperature within $\pm 0.5^{o}C$ tolerance for all points on the water. When ground truth is not provided, the thermal image indicates relative temperatures, with the coldest water surface in the image as $0^{o}C$.

THERMAL DATA COMPUTER PROCESSING



DATA ANALYSIS SYSTEM



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